

FIG. 1A CDMA Transmitter Block Diagram

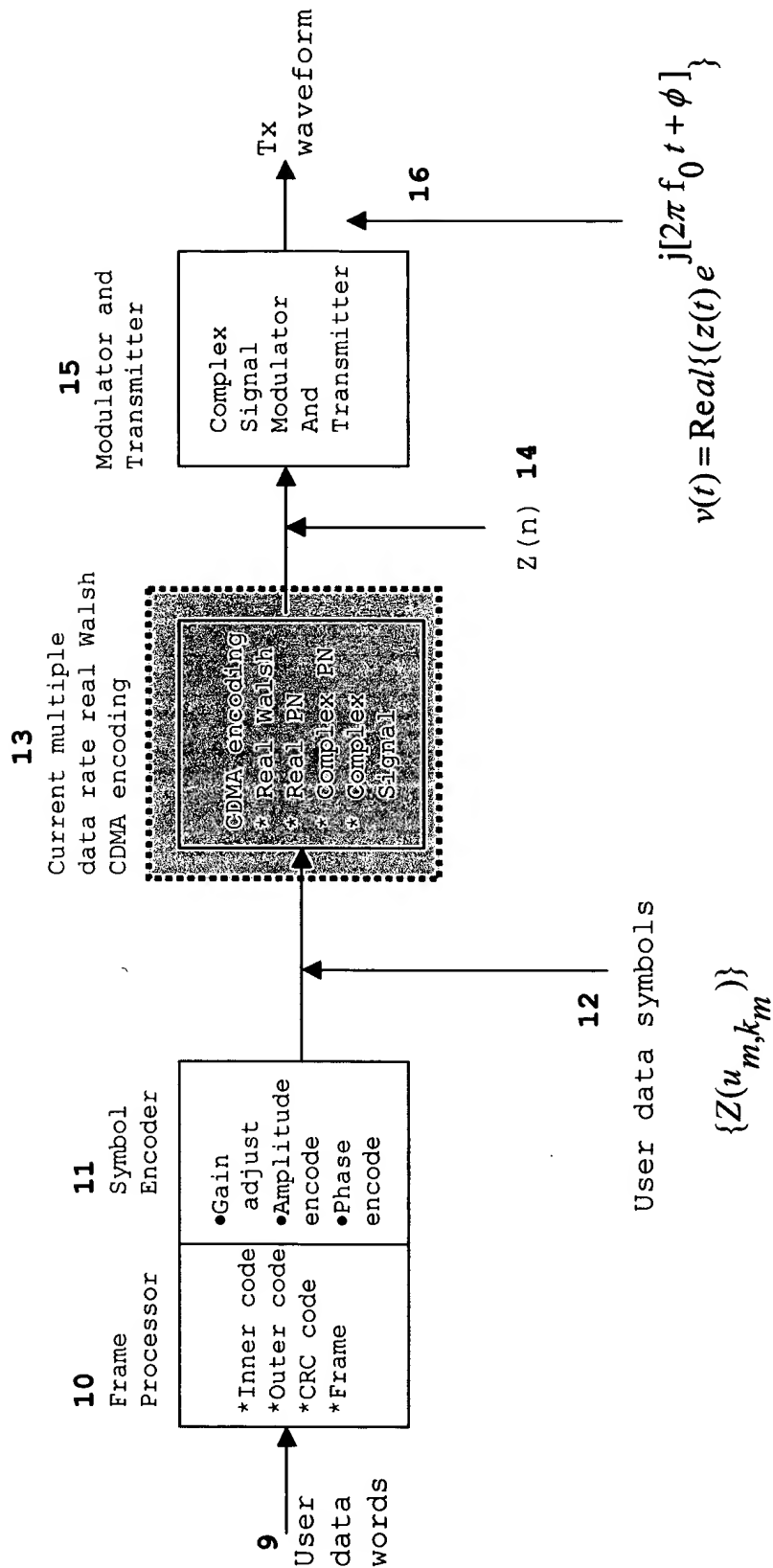


FIG. 1B CDMA Cellular Application

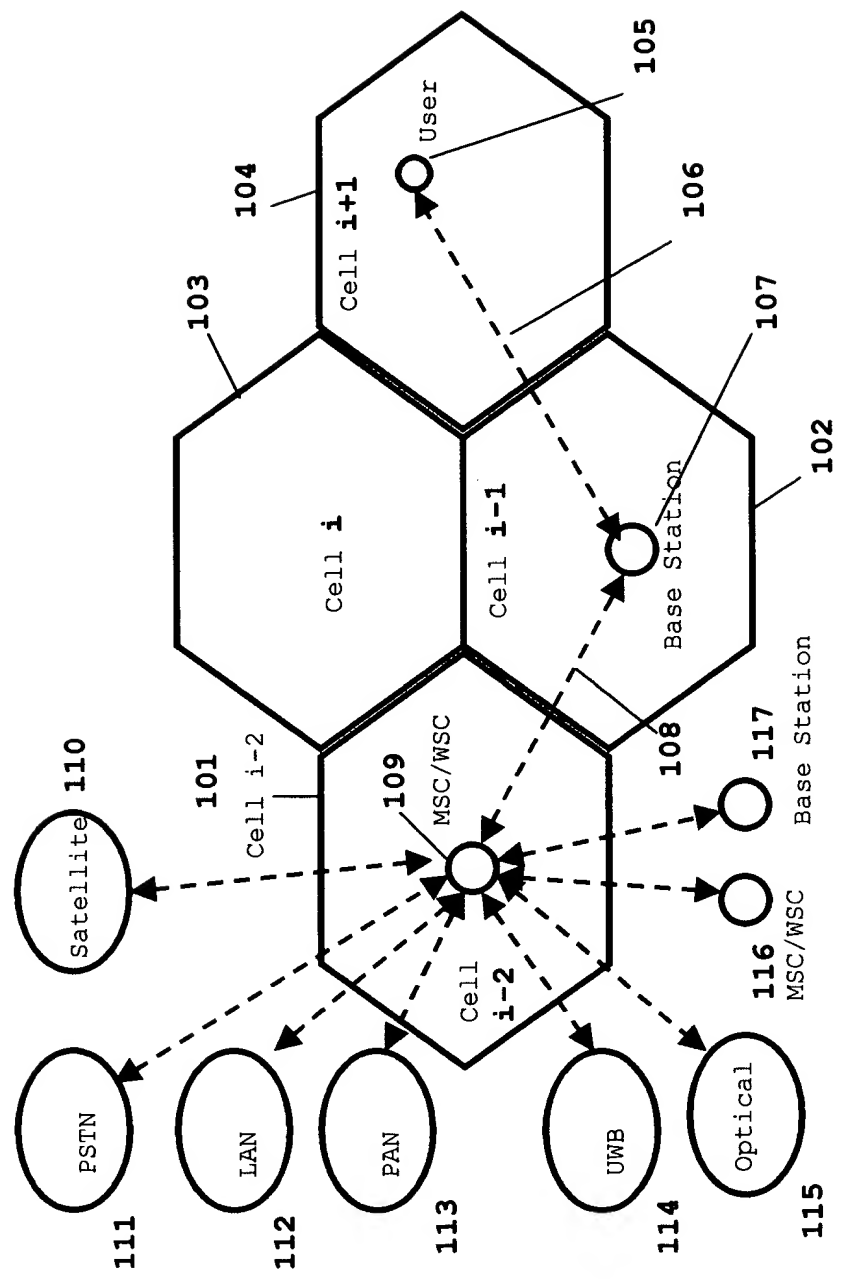




FIG. 1C Cellular Transmitter Implementation: Real Walsh

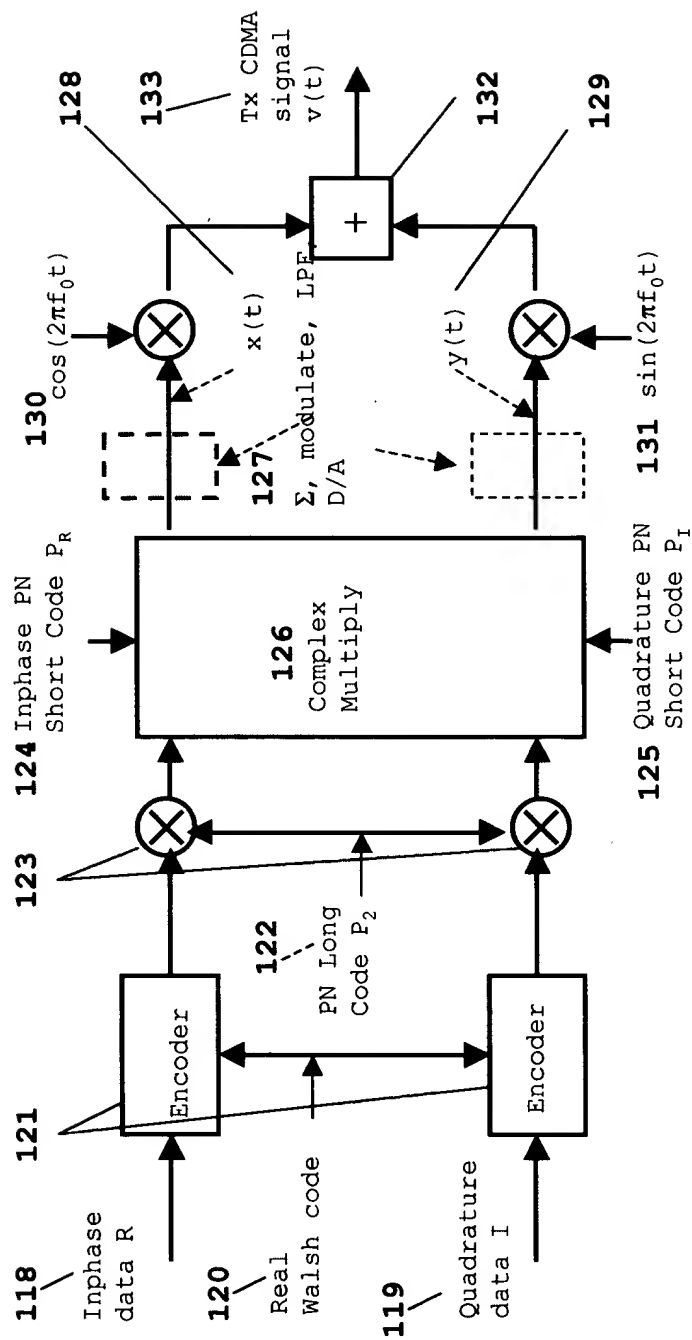




FIG. 1D Hybrid Walsh Implementation Algorithm

Hybrid Walsh Code (Sequence) Index c	Hybrid Walsh lexicographic reordering permutation of the real Walsh code vectors	Hybrid Walsh imaginary (quadrature) code index c_i
$c=0, 1, \dots, N-1$	Hybrid Walsh real (inphase) code index c_r	Hybrid Walsh imaginary (quadrature) code index c_i
$c = 0$ $c = 1$ to $(N/2-1)$ $c = N/2$ $c = N/2+\Delta c$ for $\Delta c=1$ to $N/2-1$	$c_r = 0$ $c_r = 2c$ $c_r = N-1$ $c_r = N-1-2\Delta c$	$c_i = 0$ $c_i = 2c-1$ $c_i = N-1$ $c_i = N-2\Delta c$

FIG. 1E Cellular Transmitter Implementation: Hybrid Walsh

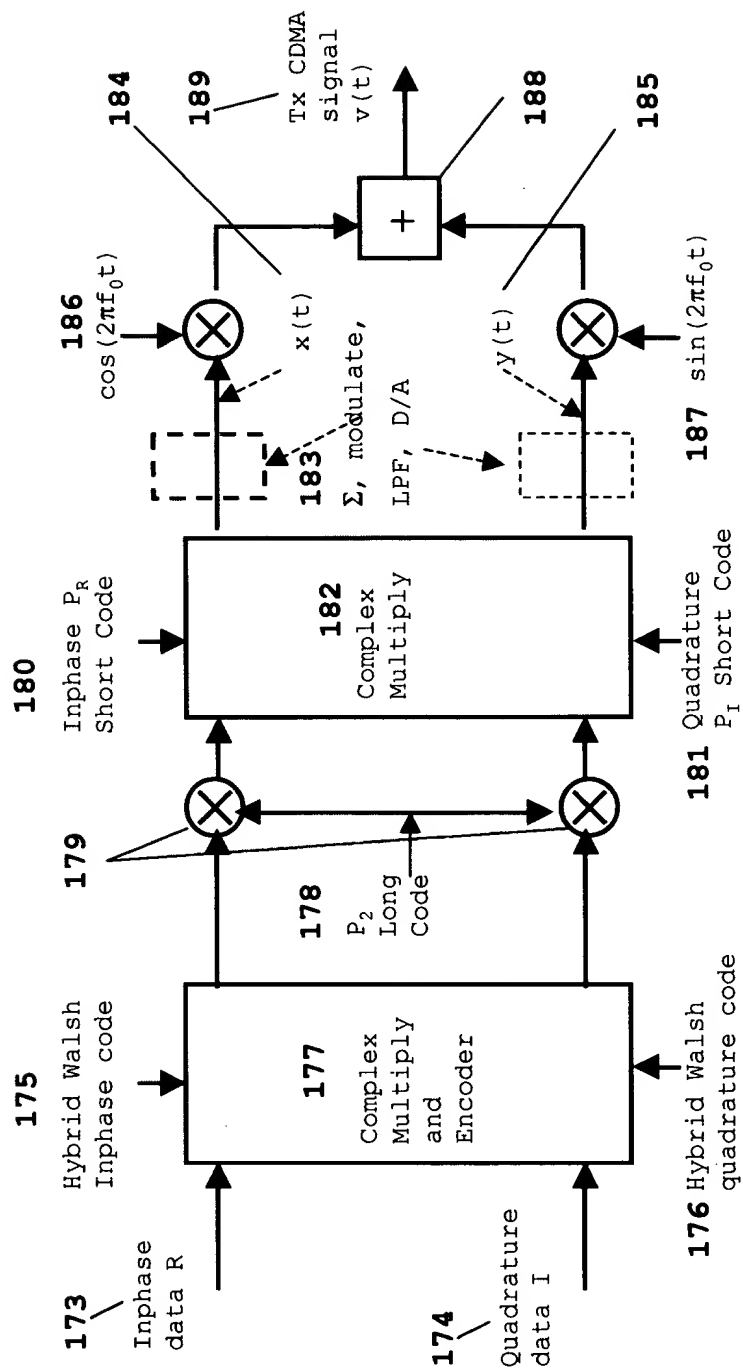




FIG. 2A Multiple Data Rate Encoder: Real Walsh

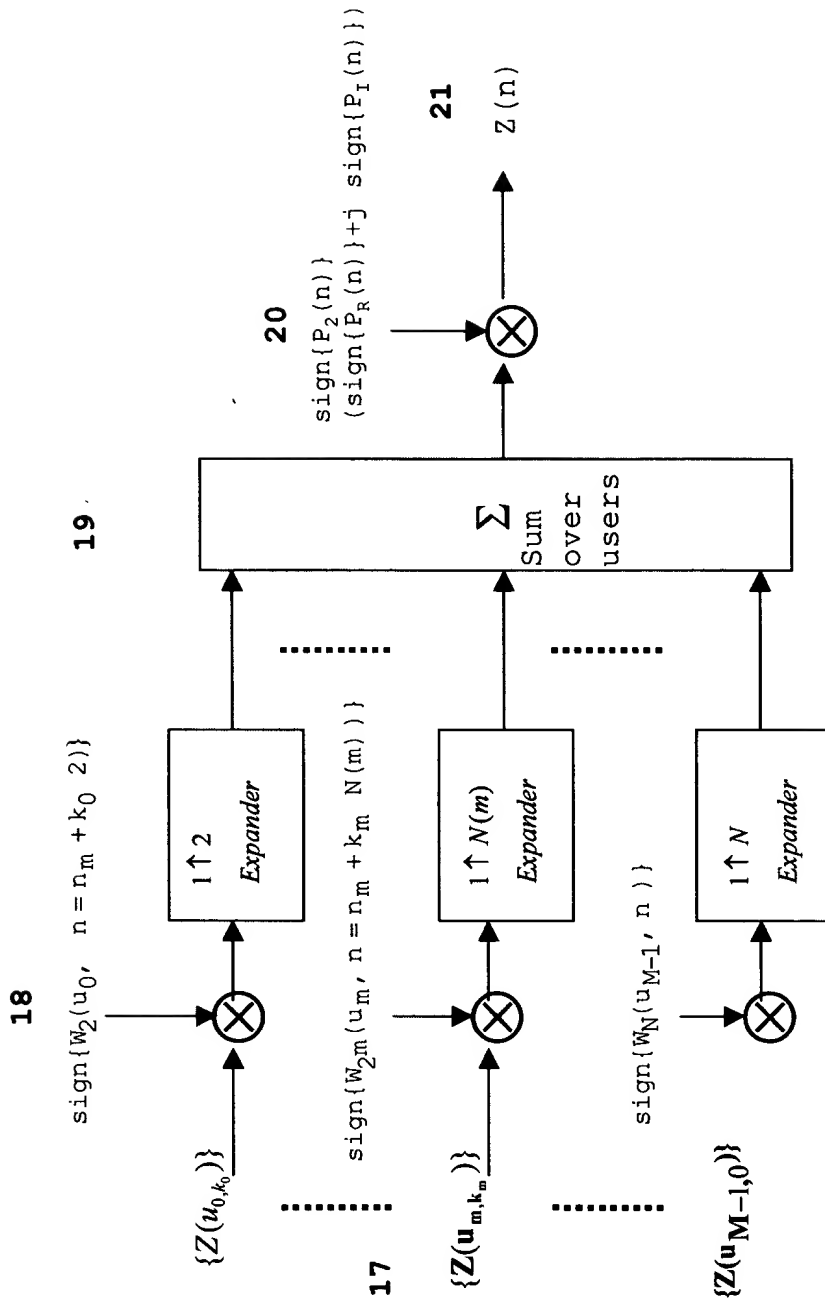




FIG. 2B Multiple Data Rate Encoder: Hybrid Walsh

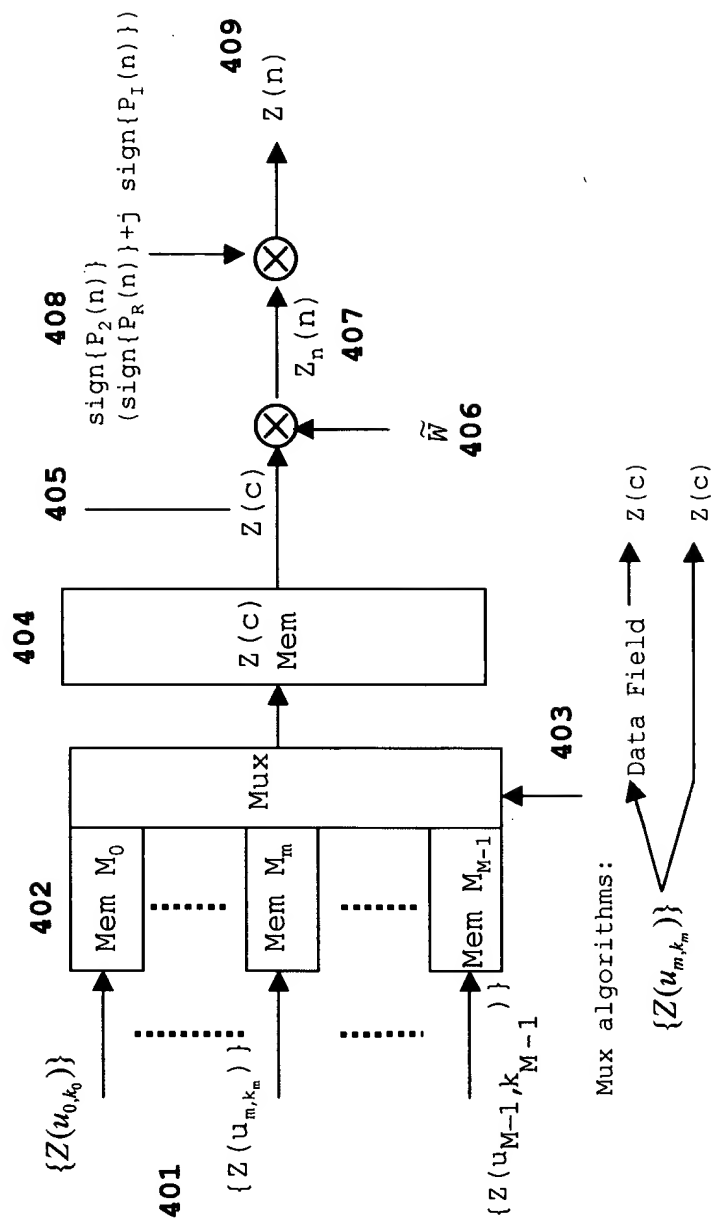
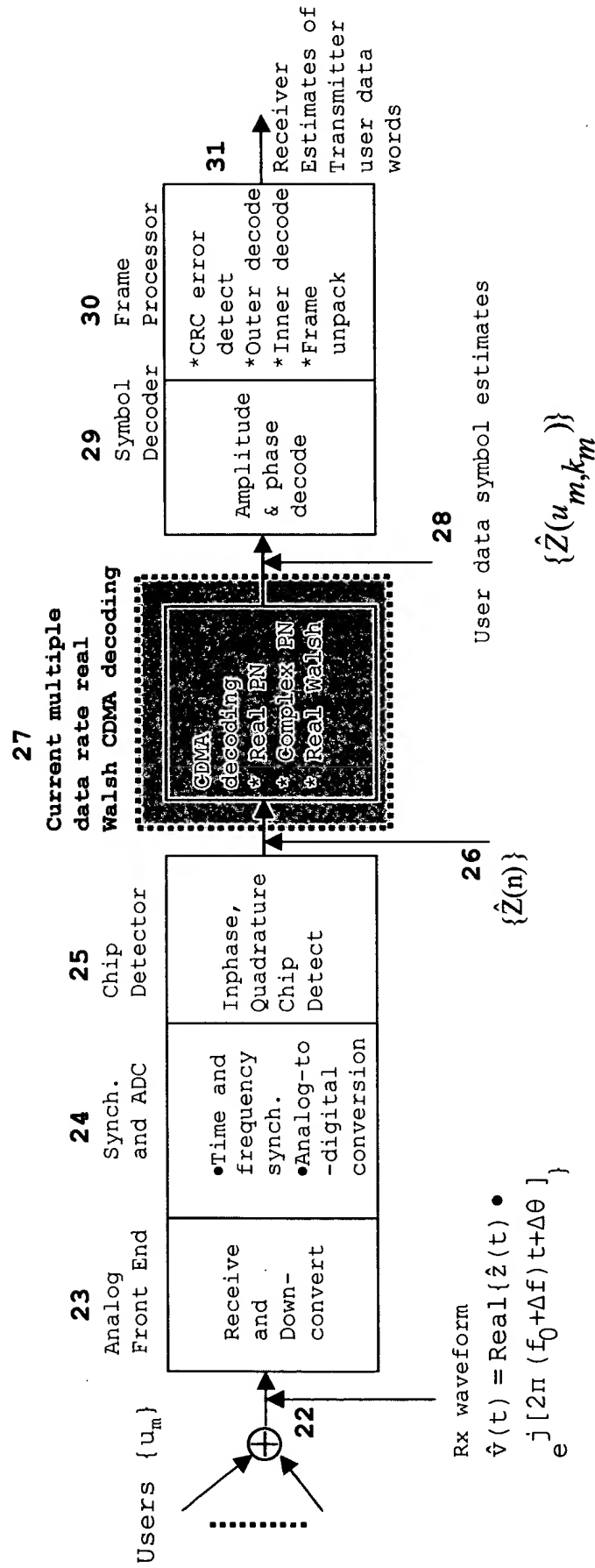




FIG. 3A CDMA Receiver Block Diagram



Rx waveform

$$\hat{v}(t) = \text{Real}\{\hat{z}(t) \cdot e^{j[2\pi(f_0 + \Delta f)t + \Delta\theta]}\}$$

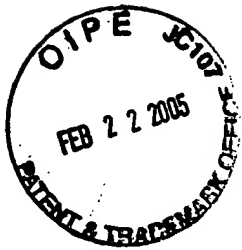


FIG. 3B Cellular Receiver Implementation: Real Walsh

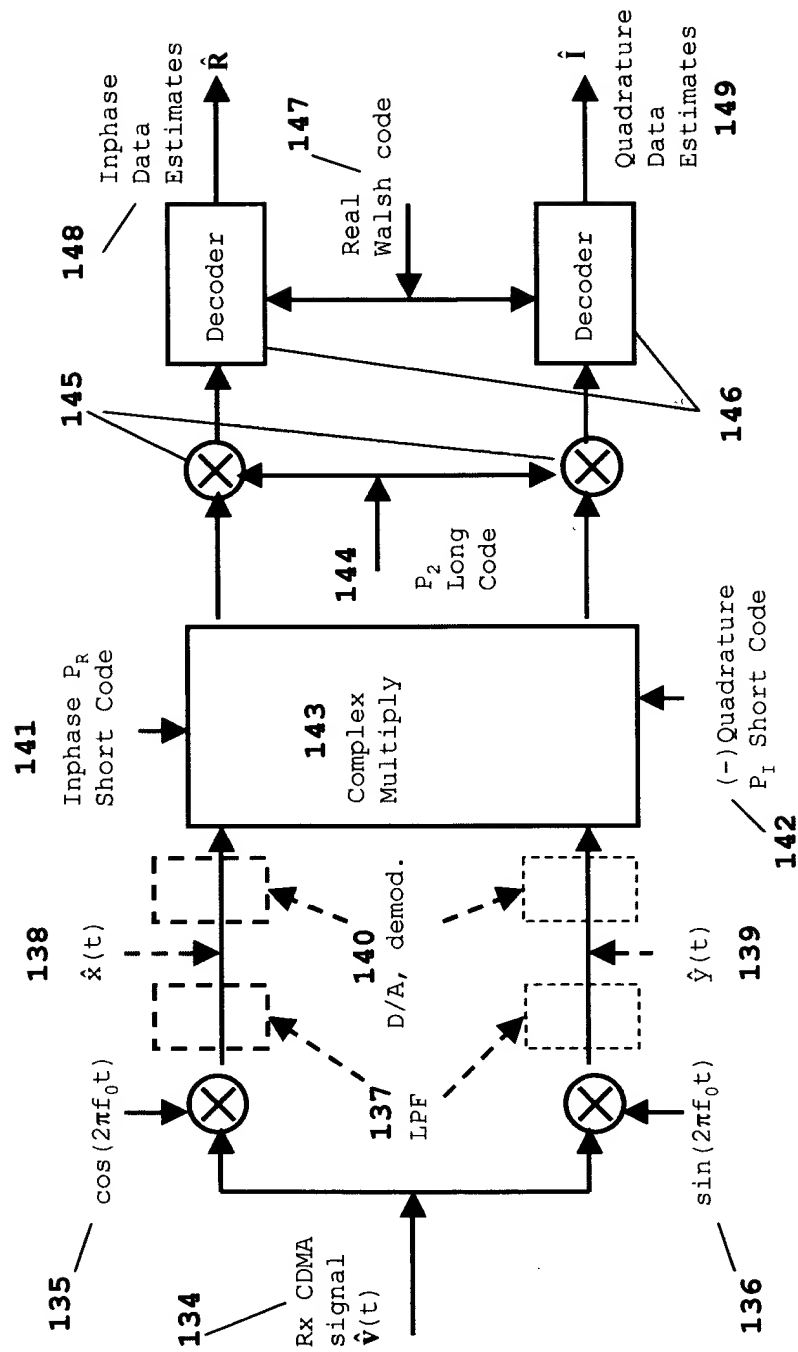




FIG. 3C Cellular Receiver Implementation: Hybrid Walsh

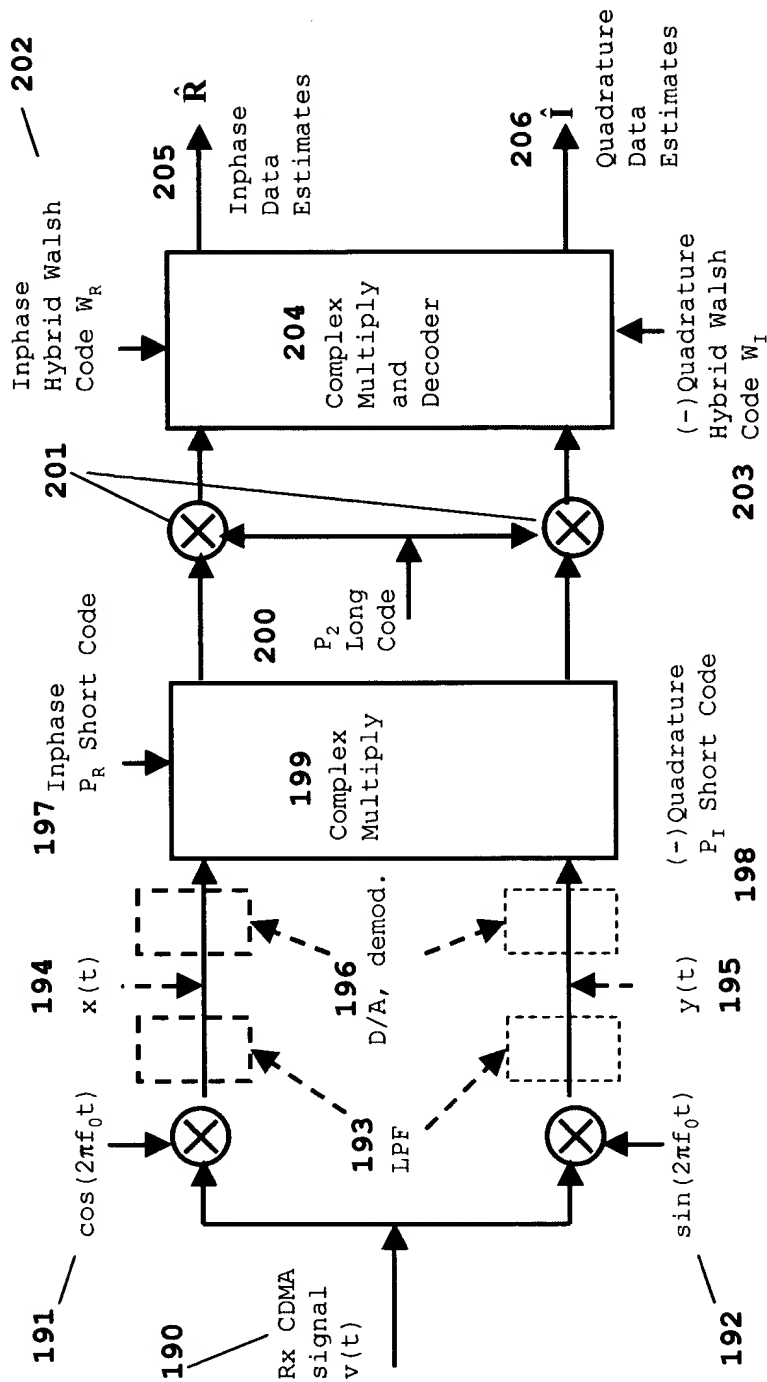


FIG. 4A Multiple Data Rate Decoding: Real Walsh

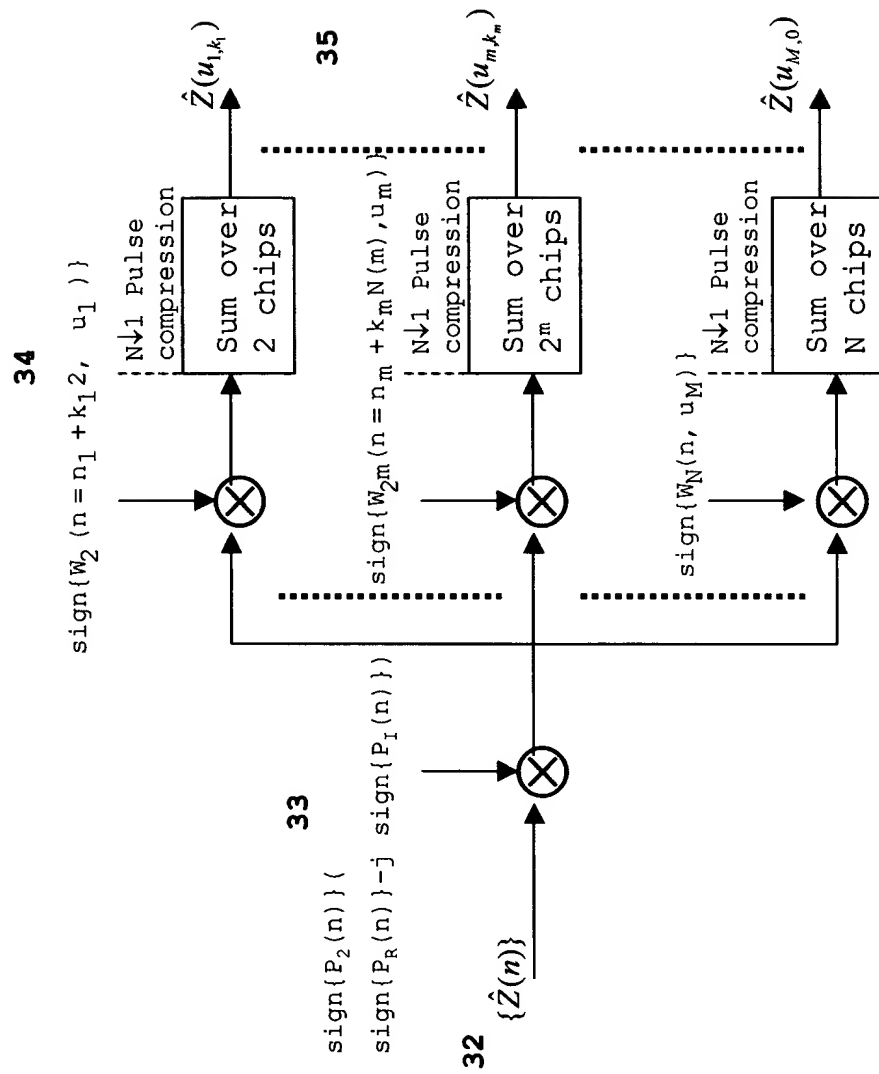




FIG. 4B Multiple Data Rate Decoding: Hybrid Walsh

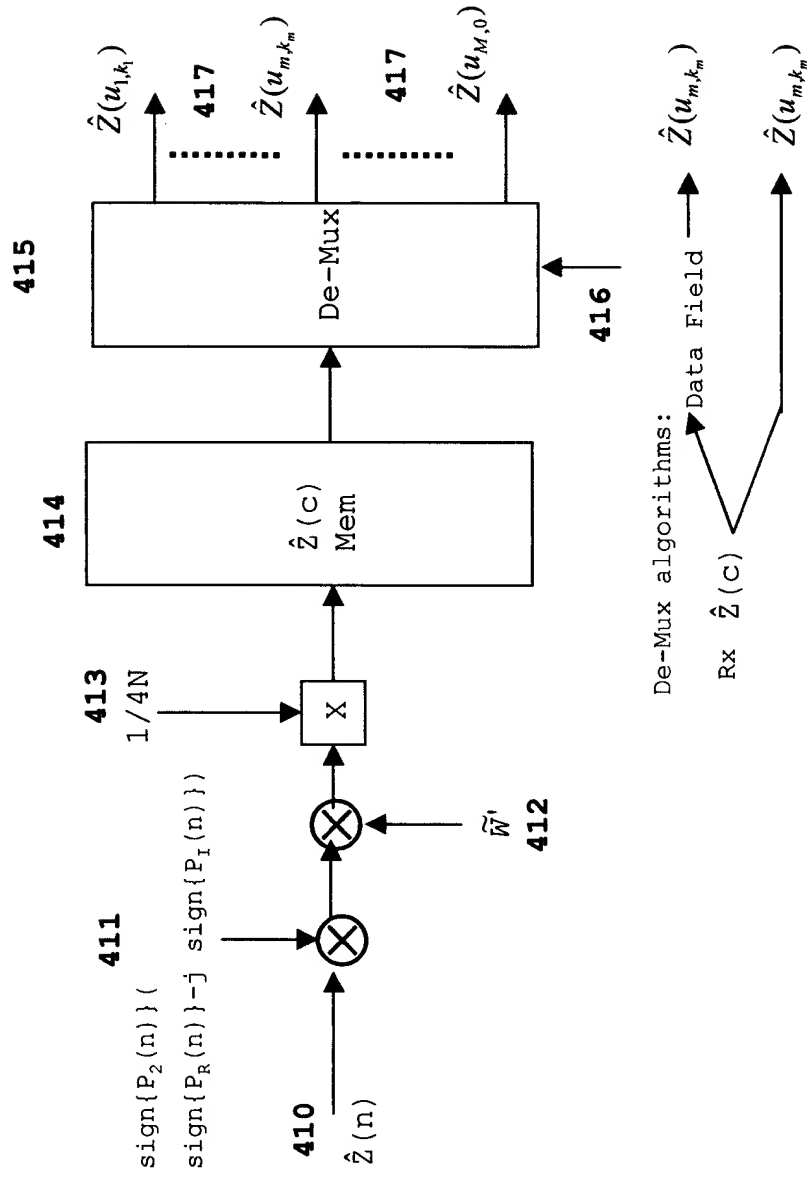


FIG. 5A Multiple Data Rate Fast Encoding
 for Generalized Hybrid Walsh
 for Example 58 in Equations (10)

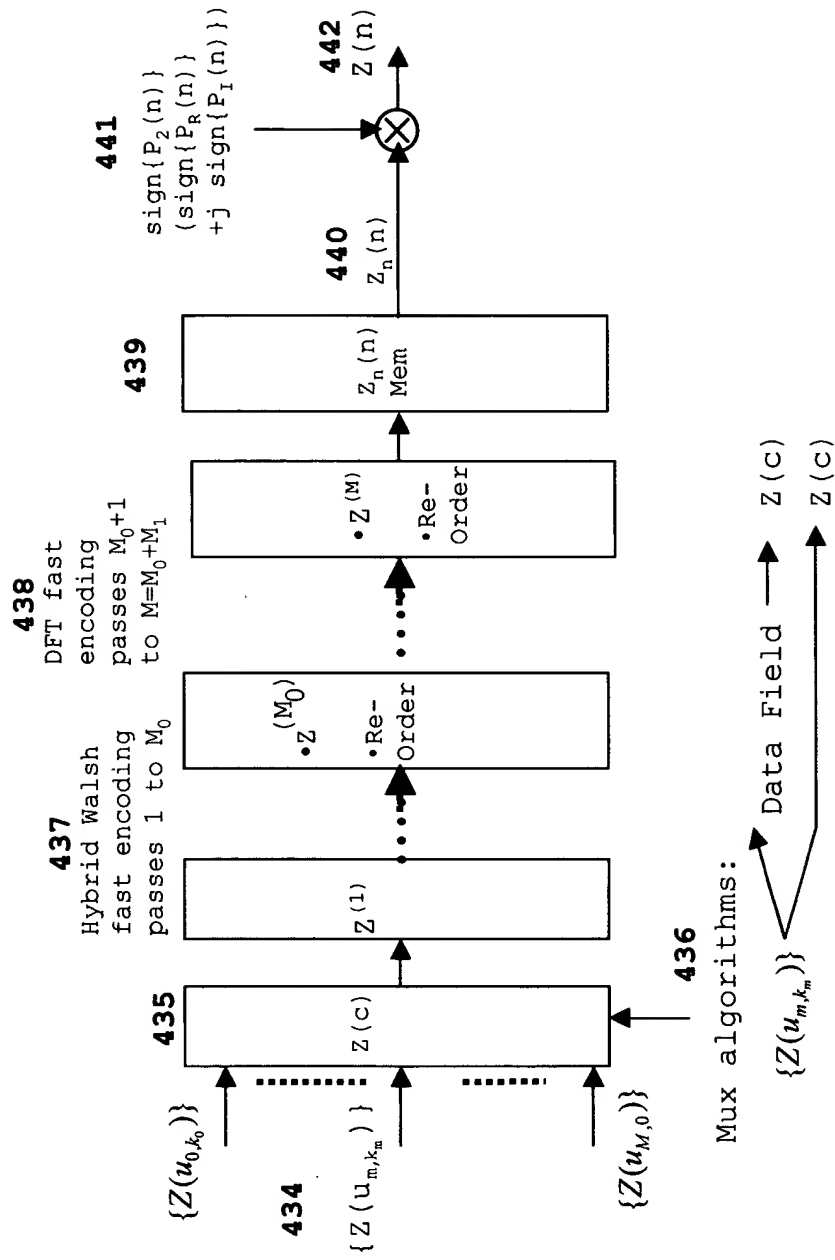
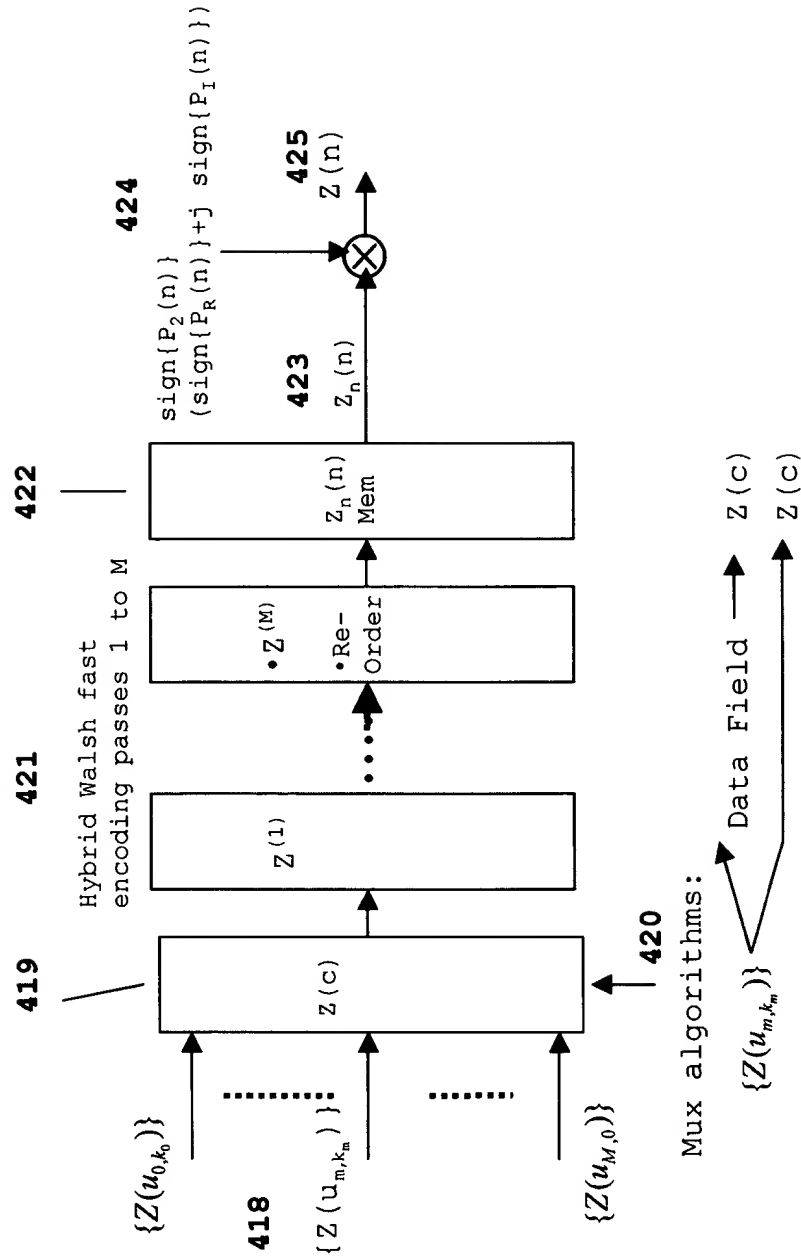
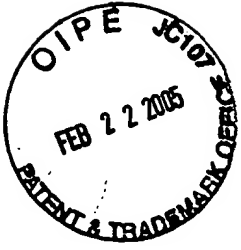
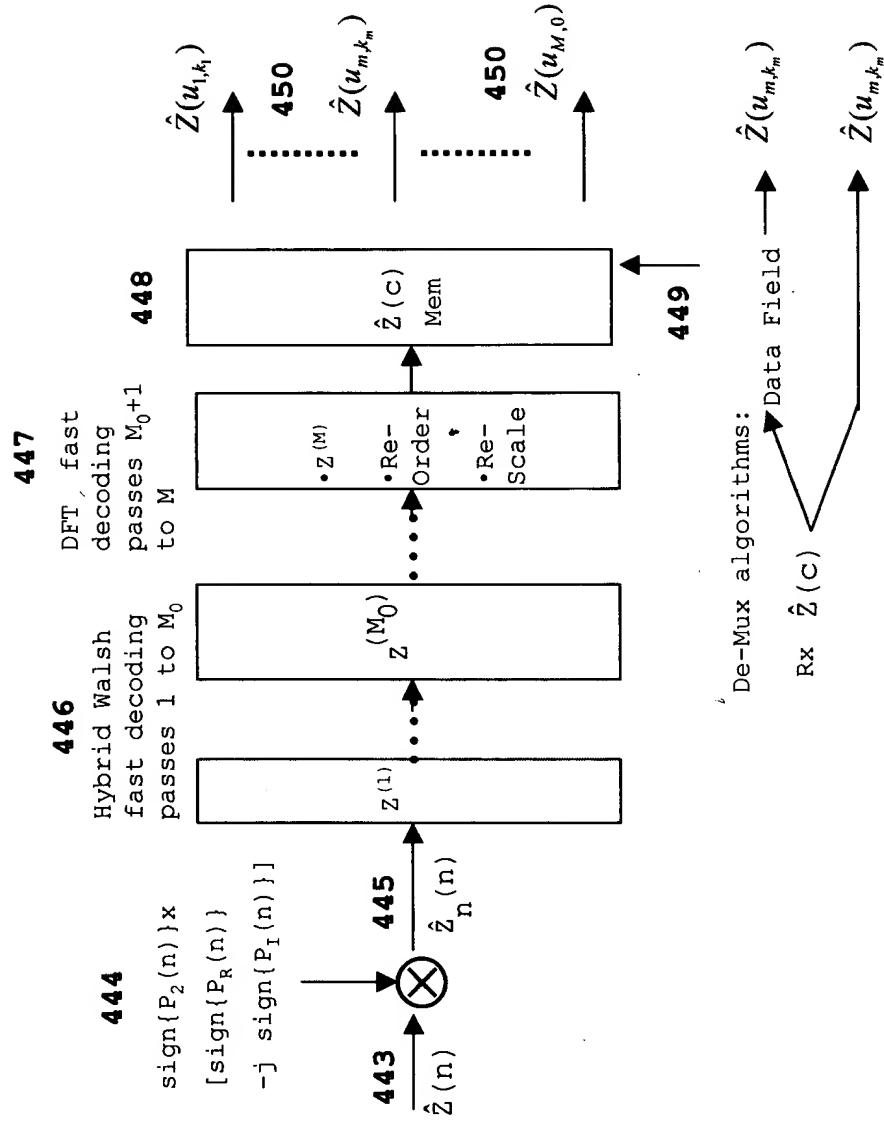


FIG. 5B Multiple Data Rate Fast Encoding
 for Hybrid Walsh





**FIG. 6A Multiple Data Rate Fast Decoding
for Generalized Hybrid Walsh
for Example 58 in Equations (10)**





**FIG. 6B Multiple Data Rate Fast Decoding
for Hybrid Walsh**

